

# Comparison of Maricopa County BMPs with San Joaquin Valley & Imperial County CMPs

June 26, 2006 Draft

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CL</b>	<b>CROPLAND – LAND PREPARATION / CULTIVATION</b>			
<b>CL-1</b>	<b>Alternate Tilling:</b>			
	Alternate Tilling	--	Same as San Joaquin	28%
<b>CL-2</b>	<b>Bed/Row Size or Spacing:</b>	--	Same as San Joaquin	
	Tree fruit			9%
	Corn Grain and Silage			12%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
	Grapes			18%
	Nut Crops			14%
	Onions and Garlic			12%
	Sugar Beets			4%
	Vegetables, Tomatoes, Melons, and Other			4%
<b>CL-3</b>	<b>Chemigation/Fertigation:</b>	No data at this time	Same as San Joaquin	--
	Alfalfa			2%
	Citrus			9%
	Corn Grain and Silage			1%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			7%
	Grapes			4%
	Nut Crops			31%
	Onions and Garlic			6%
	Sugar Beets			3.5%
	Vegetables, Tomatoes, Melons, and Other			2%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CL-4</b>	<b>Combined Operations:</b>			
	Combining land preparation operations	43% (Combining Tractor Operations)	Same as San Joaquin	35%
<b>CL-5</b>	<b>Conservation Irrigation:</b>	--	Same as San Joaquin	--
	Alfalfa			6%
	Citrus and Tree Fruit			9%
	Corn Grain and Silage			12%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
	Grapes			18%
	Nut Crops			14%
	Onions and Garlic			12%
	Sugar Beets			4%
	Vegetables, Tomatoes, Melons, and Other			4%
<b>CL-6</b>	<b>Conservation Tillage:</b>	25% - 100% (Reduced Tillage)	--	--
	Tree fruit			9%
	Corn Grain and Silage			35%
	Cotton			28%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			19%
	Grapes			26%
	Nut Crops			3%
	Onions and Garlic			11%
	Sugar Beets			3%
	Vegetables, Tomatoes, Melons, and Other			25%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CL-7</b>	<b>Cover Crops:</b>	--	Same as San Joaquin	--
	Tree Fruit			27%
	Grapes			26%
	Nut Crops			36%
<b>CL-8</b>	<b>Equipment Changes/Technological Improvements:</b>	50%	Same as San Joaquin	50%
<b>CL-9</b>	<b>Fallowing Land:</b>	--	No data at this time	--
<b>CL-10</b>	<b>Floor Management:</b>			50%
<b>CL-11</b>	<b>Integrated Pest Management:</b>	--	Same as San Joaquin	--
	Corn Grain and Silage			12%
	Cotton			19%
	Nut Crops			25%
<b>CL-12</b>	<b>Limited Activity During a High-Wind Event:</b>	25%	--	--
<b>CL-13</b>	<b>Mulching:</b>	--	Same as San Joaquin	--
	Corn Grain and Silage			12%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			7%
	Grapes			21%
	Onions and Garlic			18%
	Vegetables, Tomatoes, Melons, and Other			13%
<b>CL-14</b>	<b>Multi-Year Crop:</b>	66%	--	--
<b>CL-15</b>	<b>Night Farming:</b>	--	Same as San Joaquin	10%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CL-16</b>	<b>Non-Tillage/Chemical Tillage:</b>	--	Same as San Joaquin	--
	Alfalfa			8%
	Citrus and Tree Fruit			30%
	Grapes			17%
	Nut Crops			25%
<b>CL-17</b>	<b>Organic Practices:</b>	--	Same as San Joaquin	--
	Alfalfa			9%
	Citrus/Tree fruit			14%
	Corn Grain and Silage			17%
	Cotton			18%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			16%
	Grapes			38%
	Nut Crops			4%
	Onions and Garlic			18%
	Sugar Beets			5%
	Vegetables, Tomatoes, Melons, and Other			18%
<b>CL-18</b>	<b>Planting Based on Soil Moisture:</b>	30%	--	--
<b>CL-19</b>	<b>Precision Farming:</b>	--	Same as San Joaquin	15%
<b>CL-20</b>	<b>Tillage Based on Soil Moisture:</b>	90%	--	--
<b>CL-21</b>	<b>Time of Planting:</b>	50 % - 60% (Timing of Tillage Operation)	--	No data at this time
<b>CL-22</b>	<b>Timing of Tillage Operation:</b>	55%	--	--

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CL-23</b>	<b>Transgenic Crops:</b>	--	Same as San Joaquin	--
	Alfalfa			2%
	Corn Grain and Silage			12%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			4%
	Onions and Garlic			12%
	Vegetables, Tomatoes, Melons, and Other			6%
<b>CL-24</b>	<b>Transplanting:</b>	--	--	
	Onions and Garlic			12%
	Vegetables, Tomatoes, Melons, and Other			6%
<b>CH</b>	<b>CROPLAND – HARVEST</b>			
<b>CH-1</b>	<b>Baling/Large Balers:</b>	--	Same as San Joaquin	--
	Alfalfa			11%
	Grains			26%
<b>CH-2</b>	<b>Combined Operations:</b>			
	Combining harvest activities	29% - 71% (Reduced Harvest Activity)	Same as San Joaquin	43%
<b>CH-3</b>	<b>Continuous Tray/Dried-On-Vine:</b>	--	--	
	Harvest Activities for Grapes – Raisin Drying			32%
<b>CH-4</b>	<b>Equipment Changes/Technological Improvements:</b>	50%	Same as San Joaquin	50%
<b>CH-5</b>	<b>Fallowing Land:</b>	--	No data at this time	--

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CH-6</b>	<b>Floor Management:</b>	--	--	25%
<b>CH-7</b>	<b>Green Chop:</b>	--	Same as San Joaquin	--
	Alfalfa			10%
	Corn Grain and Silage			16.5%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			19.87%
<b>CH-8</b>	<b>Hand Harvesting:</b>	--	Same as San Joaquin	
	Grapes			30%
	Onions / garlic			17%
	Citrus, sugar beet, tree fruit, vegetables / tomatoes / melons			33%
<b>CH-9</b>	<b>Night Harvesting:</b>	--	Same as San Joaquin	10%
<b>CH-10</b>	<b>No Burning (Grinding/Chipping/Shredding, No Burning, and Soil Incorporation):</b>	--	--	--
	Citrus, Cotton, Nut Crops, and Tree Fruit			90.45%
	Alfalfa and Corn (under soil incorporation)			96.54%
	Eliminating burning of raisin trays			100%
	Eliminating burning of alfalfa seeds			92.9%
<b>CH-11</b>	<b>Pre-Harvest Soil Preparation:</b>	--	Same as San Joaquin	
	Alfalfa			7%
	Citrus/Tree Fruit			10%
	Corn Grain and Silage			5%
	Cotton			12%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			5%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Grapes			10%
	Nut Crops			6%
	Onions and Garlic			10%
	Sugar Beets			10%
	Vegetables, Tomatoes, Melons, and Other			2%
<b>CH-12</b>	<b>Reduced Harvest Activity:</b>	50%	--	--
<b>CH-13</b>	<b>Shed Packing:</b>	--	Same as San Joaquin	--
	Onions and Garlic			13%
	Vegetables, Tomatoes, Melons, and Other			11%
<b>CH-14</b>	<b>Shuttle System / Larger Carrier:</b>	--	Same as San Joaquin	--
	Alfalfa			17%
	Citrus and Tree Fruit			17%
	Corn Grain and Silage			17%
	Cotton			40%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			20%
	Grapes			16%
	Nut Crops			10%
	Onions and Garlic			17%
	Sugar Beets			17%
	Vegetables, Tomatoes, Melons, and Other			17%
<b>CO</b>	<b>CROPLAND - OTHER</b>			
<b>CO-1</b>	<b>Alternate Tilling:</b>			32.5%
<b>CO-2</b>	<b>Application Efficiencies:</b>			
	Alfalfa			8%
	Corn Grain and Silage			12%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
	Nut Crops			14%
	Onions and Garlic			12%
	Sugar Beets			4%
	Vegetables, Tomatoes, Melons, and Other			4%
<b>CO-3</b>	<b>Baling/Large Balers</b>			
	Alfalfa			11%
	Grains			26%
<b>CO-4</b>	<b>Bulk Material Control:</b>			No data at this time
<b>CO-5</b>	<b>Chemigation/Fertigation:</b>			
	Alfalfa			2%
	Citrus			9%
	Corn Grain and Silage			1%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			7%
	Grapes			4%
	Nut Crops			31%
	Onions and Garlic			6%
	Sugar Beets			3.5%
	Vegetables, Tomatoes, Melons, and Other			2%
<b>CO-6</b>	<b>Conservation Irrigation:</b>			
	Alfalfa			6%
	Citrus and Tree Fruit			9%



	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Corn Grain and Silage			12%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
	Grapes			18%
	Nut Crops			14%
	Onions and Garlic			12%
	Sugar Beets			4%
	Vegetables, Tomatoes, Melons, and Other			4%
<b>CO-7</b>	<b>Cover Crops:</b>	20% - 66%		--
	Tree Fruit			27%
	Grapes			26%
	Nut Crops			36%
<b>CO-8</b>	<b>Cross-Wind Ridges:</b>	20% - 93%		--
<b>CO-9</b>	<b>Cross-Wind Strip Cropping:</b>	No data at this time		--
<b>CO-10</b>	<b>Cross-Wind Vegetative Strips:</b>	No data at this time		--
<b>CO-11</b>	<b>Grinding/Chipping/Shredding:</b>			
	Citrus, Cotton, Nut Crops, and Tree Fruit			90.45%
	Alfalfa and Corn (under soil incorporation)			96.54%
	Eliminating burning of raisin trays			100%
	Eliminating burning of alfalfa seeds			92.9%
<b>CO-12</b>	<b>Integrated Pest Management:</b>			
	Alfalfa			8%
	Citrus and Tree Fruit			9%
	Corn Grain and Silage			12%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
	Grapes			18%
	Nut Crops			14%
	Onions and Garlic			12%
	Sugar Beets			4%
	Vegetables, Tomatoes, Melons, and Other			4%
<b>CO-13</b>	<b>Irrigation Power Units:</b>			No data at this time
<b>CO-14</b>	<b>Manure Application:</b>	No data at this time		--
<b>CO-15</b>	<b>Mulching:</b>	50% - 55%		32.5%
<b>CO-16</b>	<b>Multi-Year Crop (Alfalfa):</b>	100%		
<b>CO-17</b>	<b>Night Farming / Night Harvesting:</b>			5%
<b>CO-18</b>	<b>No Burning</b>			
	Eliminating burning of raisin trays			100%
	Eliminating burning of alfalfa seeds			92.9%
<b>CO-19</b>	<b>Non-Tillage/Chemical Tillage:</b>			
	Alfalfa			8%
	Citrus and Tree Fruit			30%
	Grapes			
	Nut Crops			25%
<b>CO-20</b>	<b>Organic Practices:</b>			
	Alfalfa			9%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Citrus/Tree fruit			14%
	Corn Grain and Silage			17%
	Cotton			18%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			16%
	Grapes			38%
	Nut Crops			4%
	Onions and Garlic			18%
	Sugar Beets			5%
	Vegetables, Tomatoes, Melons, and Other			18%
<b>CO-21</b>	<b>Permanent Cover:</b>	25% - 75%		No data at this time
<b>CO-22</b>	<b>Reduced Pruning:</b>			
	Citrus			9%
	Nut Crops			6%
<b>CO-23</b>	<b>Residue Management:</b>	39% - 92%		--
<b>CO-24</b>	<b>Sequential Cropping:</b>	50%		
<b>CO-25</b>	<b>Soil Amendments:</b>			20%
<b>CO-26</b>	<b>Soil Incorporation:</b>			
	Citrus, Cotton, Nut Crops, and Tree Fruit			90.45%
	Alfalfa and Corn (under soil incorporation)			96.54%
<b>CO-27</b>	<b>Sulfur: Reduction or Elimination of Dusting:</b>			No data at this time
<b>CO-28</b>	<b>Surface Roughening:</b>	15% - 75%		64%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
<b>CO-29</b>	<b>Transgenic Crops:</b>			
	Alfalfa			8%
	Corn Grain and Silage			12%
	Cotton			9%
	Dry Beans, Cereal Grains, Safflower, Wheat, and Barley			14%
<b>CO-30</b>	<b>Wind Barrier:</b>	0% - 90% (Artificial Wind Barrier)		30%
		25% (Tree, Shrub, or Windbreak Planting)		
<b>CU-1</b>	<b>CROPLAND – UNPAVED ROADS</b>			
	<b>Dust Suppressants:</b>	--	Same as San Joaquin	--
	Chips/mulch			33%
	Organic materials/vegetation			33%
		47% - 99% (Synthetic Particulate Suppressant)		80%
	Polymers			
	Road oil*			76%
	Sand			33%
		Variable – depends on silt content (Aggregate Cover)	Same as San Joaquin	46%
	Gravel			
<b>CU-2</b>	<b>Mechanical Pruning:</b>			55%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
CU-3	Paving:	--	Same as San Joaquin	98%
CU-4	Restricted Access:	2% (Access Restriction)	Same as San Joaquin	10%
CU-5	Speed Limits:	42%	Same as San Joaquin	--
	Reducing speed from 25.9 mph to 5 mph			81%
	Reducing speed from 25.9 mph to 10 mph			58%
	Reducing speed from 25.9 mph to 15 mph			42%
	Reducing speed from 25.9 to 25 mph			3%
CU-6	Track Out Control:	85% - 95%	Same as San Joaquin	No data at this time
CU-7	Water Application:	50% - 93%	Same as San Joaquin	70%
CU-8	Wind Barrier:	0% - 50% (Artificial Wind Barrier)  25% (Tree, Shrub, or Windbreak Planting)	Same as San Joaquin	30%
CA-1	<b>CROPLAND – UNPAVED VEHICLE / EQUIPMENT TRAFFIC AREAS:</b>			
CA-2	Critical Area Planting:	No data at this time	--	--
CA-3	Dust Suppressants:	--	Same as San Joaquin	--
	Chips/mulch			33%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	Organic materials/vegetation			33%
	Polymers	47% - 99% (Synthetic Particulate Suppressant)		80%
	Road oil*			76%
	Sand			33%
	Gravel	--	Same as San Joaquin	46%
CA-4	Manure Application:	No data at this time		
CA-5	Paving:	--	Same as San Joaquin	98%
CA-6	Restricted Access:	2% (Access Restriction)	Same as San Joaquin	10%
CA-7	Speed Limits:	42%	Same as San Joaquin	--
	Reducing speed from 25.9 mph to 5 mph			81%
	Reducing speed from 25.9 mph to 10 mph			58%
	Reducing speed from 25.9 mph to 15 mph			42%
	Reducing speed from 25.9 to 25 mph			3%
CA-8	Track Out Control:	85% - 95%	Same as San Joaquin	No data at this time
CA-9	Water Application:	50% - 93%	Same as San Joaquin	70%

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
CA-10	Wind Barrier:	0% - 50% (Artificial Wind Barrier)  25% (Trees, Shrubs, or Wind Break Planting)	Same as San Joaquin	30%
P	<b>POULTRY OPERATIONS</b>			
P-1	Manure Handling and Storage:			10%
P-2	Feeding:			No data at this time
P-3	Open Areas and Unpaved Roads:			
	Chips/mulch			33%
	Gravel			46%
	Less than 10 VT			87% (unpaved road) 60% (unpaved .area)
	Organic materials/vegetation			33%
	Paving			98%
		47% - 99% (Synthetic Particulate Suppressant)		
	Polymers			80%
	Restricted access			10%
	Road oil			76%
	Sand			33%
	Speed limit			58% (10 mph) 42% (15 mph)

	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
				3% (25 mph)
	Water	50% - 93%		70%
	Wind barrier	0% - 50% (Artificial Wind Barrier)		30%
<b>C</b>	<b>DAIRY CATTLE AND FEEDLOT CATTLE OPERATIONS</b>			
<b>C-1</b>	Corral/Manure Handling			10%
<b>C-2</b>	Overall Management/Feeding			10%
<b>C-3</b>	Unpaved Roads and Open Areas:			
	• Appropriate Equipment / Vehicles			20%
	• Chips/mulch			33%
	• Gravel			46%
	• Less than 10 VT			87% (unpaved road) 60% (unpaved area)
	• Organic materials/vegetation			33%
	• Paving			98%
	• Polymers	47% - 99% (Synthetic Particulate Suppressant)		80%
	• Restricted access			10%
	• Road oil			76%
	• Sand			33%
	• Speed bumps			81%
	•			
	•			



	Control Measure	Maricopa County BMP Control Efficiency	Imperial County CMP Control Efficiency	San Joaquin CMP Control Efficiency
	<ul style="list-style-type: none"> <li>Speed limit</li> </ul>			58% (10 mph) 42% (15 mph) 3% (25 mph)
	<ul style="list-style-type: none"> <li>Water</li> </ul>	50% - 93%		70%
	<ul style="list-style-type: none"> <li>Wind barrier</li> </ul>	0% - 50% (Artificial Wind Barrier)		30%

Sources of Data:

- 1) "Conservation Management Practices Program Report for 2005", San Joaquin Valley Air Pollution Control District, January 19, 2005.
- 2) "Draft Final Technical Memorandum Regulation VIII BACM Analysis", Prepared for Imperial County Air Pollution Control District by ENVIRON International Corporation, October 2005.
- 3) "Guide to Agricultural PM10 Best Management Practices, Maricopa County, Arizona PM10 Nonattainment Area", Governor's Agricultural BMP Committee, February 2001.
- 4) "Technical Support Document for Quantification of Agricultural Best Management Practices, Revised Final Draft", Prepared for Arizona Department of Environmental Quality by URS Corporation and Eastern Research Group, April 2001.